

REMARKS

Formal Matters

Applicants amended claims 54, 59, and 68. Applicants also added new claims 77 and 78. New claims 77 and 78 and the claim amendments find support in, for example, the specification at page 13, paragraph 45. Thus, no new matter has been added. Claims 54-59 and 61-78 are currently pending.

Applicants thank Examiners Noakes and Carlson for the very helpful interview of March 5, 2007. During the interview, Applicants discussed the enablement rejection of claims 54-59 and 61-76 and Examiner Noakes' concern about "the use of any or all microorganisms." (Interview Summary at 3.) Applicants argued that undue experimentation would not be required to determine which microorganisms work in the claimed invention, given the guidance provided in the specification. Examiner Noakes agreed that "[i]noperable embodiments are to be expected and it was determined that from the specification and prior art one skilled in said art would be able to use the method without undue experimentation." (*Id.*) In the interview, Examiner Noakes reiterated an enablement rejection of the pending claims because it is allegedly unclear how the production of mostly collagen alpha-monomers is achieved. (See Interview Summary at 3.) Applicants argued that one of skill in the art would be able to isolate the claimed collagen alpha-monomers using the guidance provided in the specification and agreed to provide the Examiner with a response and/or declaration detailing this argument. Examiner Noakes also raised her concern about the definiteness of the terms "mostly" and "predominantly" in claims 54 and 68, as well as the phrase "at least

about” in claim 59. At the conclusion of the interview, Examiner Noakes indicated that “an After Final [Response] would be considered.” (*Id.*)

Enablement Rejections

In the Office Action mailed October 6, 2006, the Office maintained the rejection of claims 54-59 and 61-76, under 35 U.S.C. § 112, first paragraph, as allegedly lacking enablement. (See Office Action at 2.) Specifically, the Office argued that the claims are drawn to an unlimited number of microorganisms used in the fermentation step and therefore undue experimentation would be required to determine which exact species of microorganism works in the claimed invention. (See Office Action at 3-5.)

Applicants respectfully traverse. One of skill in the art would be able to make and use the invention in light of the following guidance provided in the specification:

- Example 1 describes a gram staining procedure and catalase assay used to identify the Gram (+) TW-S-7-1 bacterium used in the collagen extraction process.
- Examples 2-4 describe in detail the conditions used to isolate collagen monomers from various tissues, including avian tissues (Example 2), porcine tissues (Example 3), and aquatic animal tissues (Example 4). These examples also demonstrate how SDS-polyacrylamide gel electrophoresis (SDS-PAGE) can be used to determine the abundance of collagen monomers after fermentation with the *Bacillus* bacteria. (See Figures 2-4.)

- Example 5 describes how yeast can be used to extract collagen monomers from avian tissue. Similar to the previous examples, the isolation conditions are clearly described and SDS-PAGE is used to determine the abundance of collagen monomers in the resulting collagen product. (See Figure 5.)
- Example 6 details the experimental conditions by which Type II collagen monomers can be isolated using the methods of invention. (See Figure 6.)

One of skill in the art based on these teachings would be able to use the claimed collagen monomer isolation process without undue experimentation.

Applicants also respectfully note that a claim does not lack an enabling disclosure just because some of the possible embodiments within the scope of the claimed invention may be inoperative. Indeed, the Federal Circuit has stated that “[i]t is not a function of the claims to specifically exclude . . . possible inoperative substances . . .” *Atlas Powder Co. v. E. I. DuPont de Nemours & Co.*, 750 F.2d 1569, 1576 (Fed. Cir. 1984). Even if inoperative embodiments exist, the fermentation ability of various microorganisms can be easily tested using the guidance provided in the specification to select microorganisms that aid in the isolation of collagen monomers.

During the interview of March 5, 2007, Examiner Noakes agreed that “[i]noperable embodiments are to be expected and it was determined that from the specification and prior art one skilled in said art would be able to use the method without

undue experimentation.” (Interview Summary at 3.) Therefore, Applicants respectfully request that the Office withdraw the enablement rejection of claims 54-59 and 61-76.

During the interview of March 5, 2007, Examiner Noakes reiterated an enablement rejection of claims 54-59 and 61-76, stating that it is allegedly unclear how the production of mostly collagen alpha-monomers is achieved. (See Interview Summary at 3; 11/4/05 Office Action at 5-7.) The Office alleged that “an essential missing element and step in the method and process is how a skilled artisan obtains only the α -form.” (11/4/05 Office Action at 6.) Further, the Office stated that “Applicant’s own examples add to this confusion because some obtain only the α -form (Examples 4 and 5), whereas others obtain the α and β forms.” (11/4/05 Office Action at 7.) Applicants respectfully traverse.

Independent claims 54 and 68 have been amended to more clearly define and distinctly point out the invention. The phrase “collagen composition weighing at least about 10% of the weight of the collagen-containing tissues, wherein the collagen composition comprises mostly collagen monomers” has been moved to the end of both claims 54 and 68 and amended to read “wherein the precipitated collagen product comprises collagen monomers weighing at least 10% of the weight of the total collagen in said collagen product.” Support for this amendment can be found, for instance, at page 13, paragraph 45 of the specification.

As requested by the Examiner during the interview of March 5, 2007, Applicants provide a more detailed explanation of the disclosure in the specification that allows one of skill in the art to make and use the claimed invention. Further, Applicants have

enclosed the declaration of Seah June Nam, Ph.D., detailing the enabling disclosure of the methods of the invention.

Applicants respectfully submit that the specification enables one of skill in the art to make and use the invention without undue experimentation. "The test is not merely quantitative, since a considerable amount of experimentation is permissible, if it is merely routine, or if the specification in question provides a reasonable amount of guidance with respect to the direction in which the experimentation should proceed to enable the determination of how to practice a desired embodiment of the invention claimed." *PPG Industries, Inc. v. Guardian Industries Corp.*, 75 F.3d 1554, 1564 (Fed. Cir. 1996). The specification of the present application provides such guidance as to enable one of skill in the art to isolate a collagen product containing collagen monomers, as required by the amended claims.

As detailed above, the specification includes five examples that clearly describe how the methods of the invention are used to isolate collagen monomers. (See specification, Examples 2-6, pages 18-25; Nam Declaration at ¶ 8.) For instance, Example 2 clearly explains how the collagen-containing tissue is collected and prepared, how the microorganism is cultured and ferments the collagen-containing tissue, treatment of the fermented tissue with an acidic solution and enzyme preparation, filtration, delipidation, centrifugation, and precipitation of the collagen monomers with salt. (See specification, pages 18-21; Nam Declaration at ¶ 9.) Contrary to the Office's speculation, there is no essential missing element or step that is not disclosed in the specification. The methods described in the experimental protocol,

taken together, lead to the production of collagen monomers in the amounts required by the pending claims.

Figures 2-6 demonstrate that the resulting collagen products of Examples 2-6, respectively, contain collagen monomers weighing at least 10% of the weight of the total collagen in said collagen product. (See attached Figures 2-6; Nam Declaration at ¶ 10.) Applicants also provide a new figure, labeled "For Fig. 3," which shows the composition of the collagen product resulting from the experimental protocol of Example 3. While following the same procedures detailed in Example 3, the experiment was carried out at a different time than the collagen product isolated and analyzed in original Figure 3. The SDS-PAGE gel shown in the new figure is 8%, rather than 10%, and was loaded with less sample volume in order to better separate the collagen forms and allow for their visualization. (See attached "For Fig. 3"; Nam declaration at ¶ 10.) One of ordinary skill in the art could clearly follow the experimental protocol outlined in each of Examples 2-6 and achieve the results shown in the new figure and original Figures 2-6. Furthermore, one of ordinary skill in the art could adapt the protocols provided by these examples in order to isolate collagen monomers in a manner encompassed by the claimed methods.

Contrary to the Office's suggestion, the abundance of the β and γ collagen forms present in the collagen product of Examples 2-6 does not indicate the existence of a step or steps that were not disclosed in the specification. For convenience, labels for the β and γ forms of collagen have been added to the attached figures at their appropriate molecular weights. Applicants submit that these differences are to be

expected and are based on differences in, for example, starting material and microorganism employed for fermentation. (See Nam declaration at ¶ 12.) For instance, the chicken feet used in Example 2 may initially contain differing amounts of the collagen forms than the skin of a pig used as a starting material in Example 3. (*Id.*) In addition yeast fermentation (Example 5) versus bacterial fermentation (Examples 2-4 and 6) may result in different proportions of the β and γ forms of collagen. (*Id.*) Regardless, Applicants' Examples 2-6 all result in the isolation of collagen monomers in the amount required by the pending claims.

Based upon the guidance provided by the specification described above, Applicants respectfully request that the enablement rejection of claims 54-59 and 61-76 be withdrawn.

Indefiniteness

During the interview of March 5, 2007, the Office indicated that claim 59 was allegedly indefinite for reciting the phrase "at least about." The Office also discussed claims 54 and 68 during the interview of March 5, 2007, as allegedly being indefinite for reciting the terms "mostly" and "predominantly." Applicants respectfully disagree. However, Applicants have deleted the terms "about," "mostly," and "predominantly," without prejudice or disclaimer, from these claims. Therefore, Applicants respectfully submit that claims 54, 59, and 68 are definite.

CONCLUSION

In view of the foregoing amendments and remarks, Applicants respectfully request that this Amendment under 37 C.F.R. § 1.116 be entered by the Office, thereby

placing claims 54-59 and 61-78 in condition for allowance. Applicants submit that the proposed amendments of claims 54, 59, and 68 and the addition of new claims 77 and 78 do not raise new issues or necessitate the undertaking of any additional search of the art by the Office, since all of the elements and their relationships claimed were either earlier claimed or inherent in the claims as examined. Therefore, this Amendment should allow for immediate action by the Office. Furthermore, Applicants submit that the entry of this Amendment would place the application in better form for appeal, should the Office dispute the patentability of the pending claims.

In view of the foregoing remarks, Applicants submit that the pending claims are both enabled and definite. Applicants therefore request the entry of this Amendment, the Office's reconsideration and reexamination of the application, and the timely allowance of the pending claims.

Please grant any extensions of time required to enter this response and charge any additional required fees to our deposit account 06-0916.

Respectfully submitted,

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